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rounded on the back, smooth or smoothish and with the nerves indistinct below, above conspicuously 5-nerved and scabrous, terminated with a stiff, straight awn  $\frac{1}{2}$  line to 2 lines long; palet nearly as long as its glume, entire or obtusely 2-toothed at the apex, the keels ciliate or hispid-ciliate.

This has been named in some collections *Triticum* (*Agropyrum*) *repens*, var. *tenerum*. It is often difficult to distinguish it from that species except in wanting the running rootstock. It is common throughout the Rocky Mountains, and in bottom lands it is often cut for hay, of which it makes an excellent quality.

Another very common *Agropyrum* of the mountains and plains, also valuable for forage and hay, and known among stockmen from Montana to New Mexico as "blue stem, or blue grass," is the *Agropyrum glaucum*, R. & S. of which the following is a description:

AGROPYRUM GLAUCUM, R. & S.—Culms from running rootstocks, 1 to 3 feet high, erect, rigid, smooth, with about 3 erect, rigid, narrow leaves, 4 to 6 inches long: spike distichous, 4 to 6 inches long, 4 to 6 lines wide, generally close or compact: spikelets 5 to 9-flowered, smoothish or sometimes pubescent; outer glumes slightly unequal, narrowly lanceolate, acuminate or awn-pointed, the lower 4 to 5 lines, and the upper 5 to 6 lines long, the lower 1 to 3-nerved and the upper about 5-nerved, the lateral nerves mostly all on one side of the midrib; flowering glumes 4 to 6 lines long, lanceolate, obtusish, or acute, or awn-pointed, usually sparsely pubescent, 5-nerved, the nerves indistinct below; palet about equalling its glume, rather acute, slightly bidentate, the keels hispid-ciliate, the back sparsely softly pubescent.

The whole plant is usually glaucous. In rich soil the spikelets are sometimes double at the joints.

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### Lowest Germination of Maize.

BY E. LEWIS STURTEVANT.

At the New York Agricultural Experiment Station we have obtained the following data relating to the germination of maize. The temperatures given are of a thermometer with the bulb in with the seed used, and each degree carefully corrected with a standard. Readings were taken hourly from 7 A. M. to 11 and 12

P. M., as a check upon the accuracy of our apparatus, which was designed to keep at a constant temperature with a variation of but two degrees. Our success with the lowest temperatures was perfect. The higher temperatures were with trial apparatus, and had a wider range until experience led to perfecting.

The following table gives the hour at which first germination was observed at the various temperatures, the seed from the same ear for each variety :

	Exp. IV. 41°.5 to 43°.7	Exp. III. 43°.5 to 47°.8	Exp. III. 43°.5 to 49°.6	Exp. II. 45°.5 to 50°.1	Exp. I. 48°.5 to 55°.5
<i>Dent Corn.</i>					
Adams' Early.....	233	.....	.....	180	142
Chester Co. Mammoth.....	233	264	.....	168	142
<i>Flint Corn.</i>					
Waushakum.....	331	336	.....	228	142
Eight-rowed White.....	331	.....	.....	216	150
<i>Soft Corn.</i>					
Tuscarora.....	378	.....	408	228	161
Zuni Blue.....	431	.....	.....	228	185
<i>Pop Corn.</i>					
White Pearl.....	378	336	.....	228	142
Amber Rice.....	378	.....	.....	228	142
Dwarf Golden.....	498	.....	.....	228	142
<i>Sweet Corn.</i>					
Stowell's Evergreen.....	452	.....	504	228	195
Narragansett.....	498	.....	.....	300	209

Twenty-five seed of a kind, in duplicate trials, were used. Yet even with this number we did not succeed in eliminating the individual variability, one pocket furnishing germinating seed many hours before another. Thus, one trial with Naragansett Sweet gave first germination of one seed in 209 hours, its duplicate in 222 hours in Experiment I; and in Experiment IV the same seed germinated in one trial in 498 hours and its duplicate in 523 hours. Dwarf Golden pop, in Experiment IV, germinated in 498 hours in one trial and 738 hours in its duplicate.

In Experiments I and II, one hundred per cent. germinated, the trials extending 281 hours in I and 408 hours in II. Experiment III continued 1008 hours, and Experiment IV 708 hours, the average germination after this interval being as below, but the ungerminated seeds in all cases sound at the conclusion of the trial.

PER CENT. SEEDS GERMINATED, AND SOUND BUT UNGERMINATED IN EACH EXPERIMENT.

	Exp. I. 281 hours.	Exp. II. 408 hours.	Experiment III. 1008 hours.		Experiment IV. 708 hours.	
	Germ.	Germ.	Germ.	Ungerm.	Germ.	Ungerm.
<i>Dent Corn.</i>						
Adams' Early.....	100	100	.....	.....	100	.....
Chester Co. Mam'th..	100	100	100	.....	100	.....
<i>Flint Corn.</i>						
Waushakum.....	100	100	92	8	100	.....
Eight-rowed White..	100	100	.....	.....	84	16
<i>Soft Corn.</i>						
Tuscarora.....	100	100	84	16	50	50
Zuni Blue.....	100	100	.....	.....	74	26
<i>Pop Corn.</i>						
White Pearl.....	100	100	80	20	44	56
Amber Rice.....	100	100	.....	.....	46	54
Dwarf Golden.....	100	100	.....	.....	18	82
<i>Sweet Corn.</i>						
Stowell's Evergreen..	100	100	84	16	62	38
Narragansett.....	100	100	.....	.....	60	40

We have thus carried the lowest temperature at which maize will germinate to below 43°.7 F. for all the form species. It is probable that further trial will place the lowest temperature at 42° or below, but the difficulty of keeping an unquestioned record between close limits for a long period is very great. In Experiment IV we succeeded for 29½ days, when repairs to our water service necessitated the concluding.

The apparatus used was a double box, made especially tight, and lined on three sides with a flat copper pipe, through which spring water, at a temperature of 36°, was kept constantly circulating. A thermostat within operated upon a clock outside through electrical communication, and when the temperature dropped below the point at which it was set, shutters were opened which admitted the warm air of the room until the thermostat again closed them through the agency of the clock. The germinator was a copper box, containing water, and fitted with cloth pockets, and a thermometer passing through a cork inserted in the refrigerator box had its bulb included within the pockets along with the seed, and its readings served as a check upon the working of the thermostat